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(54) Title: TECHNIQUES FOR PREAMBLE PUNCTURING

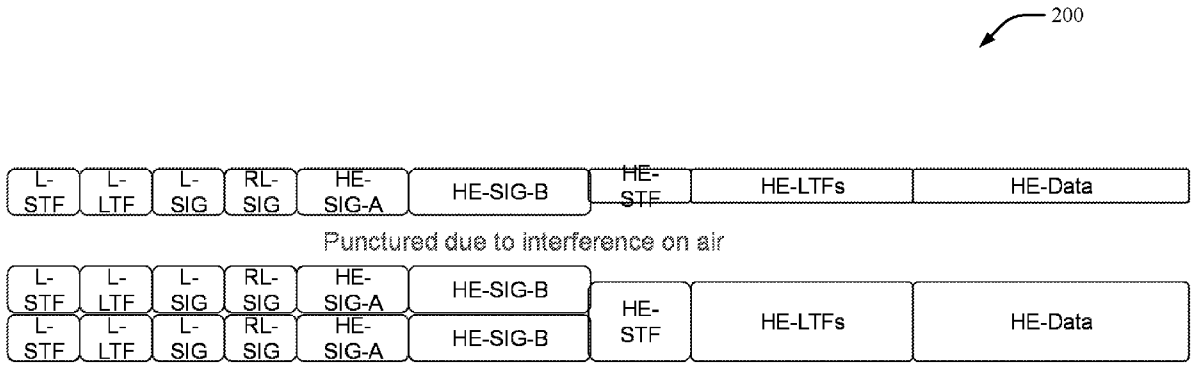


FIG. 2

(57) Abstract: The present disclosure provides techniques for preamble puncturing in wireless local area networks (WLANs). In one implementation, an access point (AP) can identify, within a channel width, one or more bandwidth regions associated with incumbent technologies. The AP can broadcast or advertise, to a basic service set (BSS) initiated or started by the AP, a preamble puncture pattern in one or more management frames, the preamble puncture pattern being based on the bandwidth regions associated with incumbent technologies. In another implementation, an AP can identify a single user (SU) preamble puncture transmission, and can signal in a common portion of a SIG-B field of a multi-user (MU) PPDU format that a resource unit (RU) size is assigned to a same user to indicate the SU preamble puncture transmission. Although these techniques may be used in any frequency band, typical frequency bands may include, but are not limited to, a 2.4 GHz band, a 5 GHz band, and/or a 6 GHz band.

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[Continued on next page]

(81) **Designated States** *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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A. CLASSIFICATION OF SUBJECT MATTER
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ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	YONGHO SEOK (NEWRACOM): "lb225-cr-10_22_2_5 ; 11-17-0209-01-00ax-lb225-cr-10-22-2-5", IEEE DRAFT; 11-17-0209-01-00AX-LB225-CR-10-22-2-5, IEEE-SA MENTOR, PISCATAWAY, NJ USA , vol. 802.11ax, no. 1 28 February 2017 (2017-02-28), pages 1-8, XP068112660, Retrieved from the Internet: URL:https://mentor.ieee.org/802.11/dcn/17/ 11-17-0209-01-00ax-lb225-cr-10-22-2-5.docx [retrieved on 2017-02-28]	1-22,51, 52
Y	page 2 - page 5	41-50, 55,56

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 April 2019	08/05/2019

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Devillers, Bertrand

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Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Stacey Robert: "IEEE Draft P802.11ax D1.3", , 5 June 2017 (2017-06-05), XP055506059, Retrieved from the Internet: URL:http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.3.pdf [retrieved on 2018-09-11]	1-22,51, 52
Y	page 171 - page 172; tables 10-10 tables 28-18	41-50, 55,56

Y	US 2017/280452 A1 (CHOI JINSOO [KR] ET AL) 28 September 2017 (2017-09-28) paragraph [0134] - paragraph [0135]	41-50, 55,56

X,P	MATTHEW FISCHER (BROADCOM LTD): "Disallowed-Sub-Channels", IEEE DRAFT; 11-18-0496-02-00AX-DISALLOWED-SUB-CHANNELS, IEEE-SA MENTOR, PISCATAWAY, NJ USA , vol. 802.11ax, no. 2 17 April 2018 (2018-04-17), pages 1-7, XP068125503, Retrieved from the Internet: URL:https://mentor.ieee.org/802.11/dcn/18/11-18-0496-02-00ax-disallowed-sub-channels.docx [retrieved on 2018-04-17] page 3 - page 7	1,12,51, 52

X	WO 2017/111567 A2 (WILUS INST STANDARDS & TECHNOLOGY INC [KR]) 29 June 2017 (2017-06-29) the whole document & EP 3 396 925 A2 (WILUS INSTITUTE OF STANDARDS AND TECH INC [KR]; SK TELECOM CO LTD [KR]) 31 October 2018 (2018-10-31) paragraph [0249] - paragraph [0251]; figure 44	23-40, 53,54

X	US 2017/181129 A1 (BHARADWAJ ARJUN [US] ET AL) 22 June 2017 (2017-06-22) paragraph [0128] paragraph [0131]; figures 11A-11B paragraph [0139] - paragraph [0142]	23-40, 53,54

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	HONGYUAN ZHANG (MARVELL): "Spec Text for BW Field in HE-MU Format ; 11-16-0899-00-00ax-spec-text-for-bw-field-in-he-mu-format", IEEE DRAFT; 11-16-0899-00-00AX-SPEC-TEXT-FOR-BW-FIELD-IN-HE-MU-FORMAT, IEEE-SA MENTOR, PISCATAWAY, NJ USA , vol. 802.11ax 25 July 2016 (2016-07-25), pages 1-4, XP068107211, Retrieved from the Internet: URL:https://mentor.ieee.org/802.11/dcn/16/11-16-0899-00-00ax-spec-text-for-bw-field-in-he-mu-format.docx [retrieved on 2016-07-25] page 2 - page 3 -----	23-40, 53,54
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2018/058216

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-22, 41-52, 55, 56

   Semi-statically (or long-term) signaling of preamble puncture pattern using a management frame(s).

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2. claims: 23-40, 53, 54

   Backward compatible signaling of the preamble puncture of a SU transmission with reduced overhead using the common portion of a SIG-B field of a MU PPDU.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2018/058216

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